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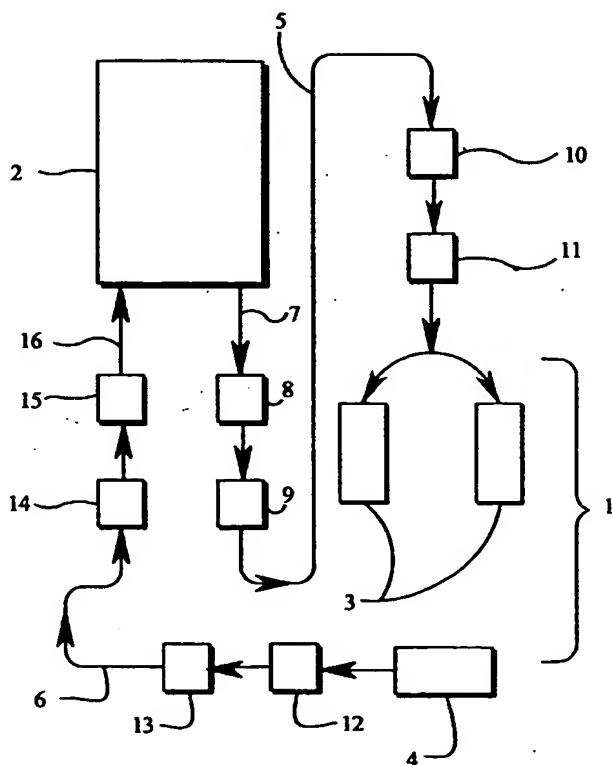
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(54) Title: HEADSET ARRANGEMENT WITH OPTICAL FIBER CONNECTION TO A COMMUNICATION DEVICE FOR  
REDUCTION OF THE RADIATION TO THE USER AND COMMUNICATION METHOD



(57) Abstract: A headset arrangement for a communications device (2) is provided for eliminating the transmission of RF energy from the device to the headset arrangement. A connector (7, 16) is provided for connection to the communications device to receive therefrom and/or transmit an electrical signal. A headset (1) includes at least one of a loudspeaker (3) and a microphone (4). First conversion means (9, 14; 15) is connected to the connector for converting between the electrical signal at the connection means and an optical signal. Second conversion means (10, 13; 12) is connected to the headset for converting between an electrical signal at the headset means and an optical signal. A fibre-optic cable (5, 6; 17) transmits an optical signal between the first and second conversion means.

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**HEADSET ARRANGEMENT WITH OPTICAL FIBER CONNECTION TO A COMMUNICATION  
DEVICE FOR REDUCTION OF THE RADIATION TO THE USER AND COMMUNICATION  
METHOD**

The present invention relates to a headset arrangement for  
5 use with a communication device, such as a telephone, and to  
a corresponding communication method. The invention is  
particularly useful when used in conjunction with a  
telephone, in particular a mobile telephone.

10 Headset arrangements for communication devices are well  
known. In particular, such headsets are commonly used with  
telephones, enabling the user to have his or her hands free  
while continuing to use the telephone. Known telephone  
headsets typically consist of a microphone worn adjacent to  
15 the user's mouth so as to pick up the user's voice, and one  
or two earpieces, each containing a loudspeaker. Signals  
from the telephone to the loudspeaker(s), and from the  
microphone to the telephone, are transmitted by means of  
connecting wires.

20 Concerns have been raised, however, about the use of such  
headsets, particularly in conjunction with mobile telephones.  
Mobile telephones emit low-level RF radiation and it has been  
postulated that the arrangement of a conventional headset, in  
25 particular the conducting wires, may increase the amount of  
such radiation being conducted to the user. There is

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therefore a requirement for a communications headset which avoids this problem.

It is therefore an object of the present invention to provide  
5 a communications headset and a communication method for a  
radio frequency communication device such as a mobile  
telephone which reduces the amount of radiation to which the  
user may be exposed.

10 According to one aspect of the present invention there is  
provide a headset arrangement for a communications device  
comprising: means for connection to the communications device  
to receive therefrom and/or transmit thereto an electrical  
signal; headset means including at least one of a loudspeaker  
15 and a microphone; first conversion means connected to the  
connection means for converting between the electrical signal  
at the connection means and an optical signal; second  
conversion means connected to the headset means for  
converting between an electrical signal at the headset means  
20 and an optical signal; and fibre-optic transmission means  
communicating an optical signal between the first and second  
conversion means.

According to another aspect of the present invention there is  
25 provided a communication method for communicating a signal  
between a communications device and a headset means

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comprising the steps of: converting between an electrical signal at the communications device and an optical signal in a first conversion means; converting between an electrical signal at the headset means and an optical signal in a second conversion means; and transmitting the optical signals  
5 between the first and second conversion means by way of a fibre-optic transmission means.

Two loudspeakers may be provided.

10

The headset arrangement may incorporate both a loudspeaker and a microphone. Two separate fibre-optic transmission means may be provided to transmit optical signals, one for the microphone and the other for the loudspeaker(s). In this  
15 case, the first and second conversion means may each comprise means for converting signals for the microphone and means for converting signals for the loudspeaker(s). Alternatively communication may be effected by a single fibre-optic transmission means, first and second multiplexor means being  
20 provided for combining and separating the electrical signals at each end of the fibre-optic transmission means.

Amplifier means may be provided for amplifying signals from the microphone.

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Amplifier means may be provided for amplifying signals to the loudspeaker(s).

In an embodiment of the invention, the communications device  
5 is a telephone, in particular a mobile telephone.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying  
10 drawings in which:

Figure 1 is a schematic illustration of one embodiment of a headset arrangement according to the present invention in conjunction with a communications device; and  
15

Figure 2 is a schematic illustration of another embodiment of a headset arrangement according to the present invention in conjunction with a communications device.

20 Figure 1 shows an arrangement according to the present invention. In Figure 1, a headset (indicated generally as 1) is shown connected to a radio frequency communications device, in this case a mobile telephone 2. The headset 1 incorporates loudspeakers 3 to be arranged at opposite sides  
25 of a user's head and a microphone 4. In practice there may only be one loudspeaker 3, and the microphone 4 may either be

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attached to the headset or may be arranged so as to be worn separately, for example attached to the user's clothing. The loudspeakers 3 and the microphone 4 are connected to the mobile telephone 2 by means of two fibre-optic cables 5 and 6.

In addition to the fibre-optic cable 5 which connects the loudspeakers 3 to the mobile telephone 2, other devices are provided as follows. A connector 7 plugs into the mobile telephone 2 so as to receive signals corresponding to the sounds to be transmitted to the user. An amplifier 8 is optionally provided to amplify the signal prior to its conversion to an optical signal by an optical converter 9. From the optical converter 9, the optical signal passes through fibre-optic cable 5 and into another optical converter 10. The converter 10 converts the signal into an electrical signal, which is then amplified by an amplifier 11 and passed to the loudspeakers 3.

Similarly, signals from the microphone 4 pass into an amplifier 12 before entering a further optical converter 13. The signal is converted in the converter 13 into an optical signal and transmitted down fibre-optic cable 6 to a still further optical convertor 14. The optical signal is converted to an electrical signal in the converter 14 and

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amplified by a further amplifier 15 before passing through a connector 16 into the mobile telephone 2.

5 The microphone 4 and loudspeakers 3 may have a suitable power source connected thereto (not shown), which is preferably separate from the mobile telephone so as to avoid the use of conducting wires between the mobile telephone and the headset arrangement.

10 Figure 2 shows an alternative arrangement according to the present invention. Essentially, the arrangement of Figure 2 is similar to that of Figure 1 except that only a single fibre-optic cable is used to perform the functions of both cables 5 and 6 of Figure 1 by multiplexing the signals in a  
15 manner known per se.

Thus Figure 2 shows a headset (indicated generally as 1) is connected to a radio frequency communications device, in this case a mobile telephone 2. The headset 1 incorporates  
20 loudspeakers 3 to be arranged at opposite sides of a user's head and a microphone 4. As with the embodiment of Figure 1, in practice there may only be one loudspeaker 3, and the microphone 4 may either be attached to the headset or may be arranged so as to be worn separately, for example attached to  
25 the user's clothing. The loudspeakers 3 and the microphone 4



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are connected to the mobile telephone 2 by means of a single fibre-optic cable 17.

In addition to the fibre-optic cable 17 which connects the loudspeakers 3 and microphone 4 to the mobile telephone 2, other devices are provided as follows. Connector 7 plugs into the mobile telephone 2 so as to receive signals corresponding to the sounds to be transmitted to the user. Amplifier 8 is optionally provided to amplify the signal. The signal then passes to a multiplexor 18 prior to its conversion to an optical signal by an optical converter 19. From the optical converter 19, the optical signal passes through fibre-optic cable 17 and into another optical converter 20. The converter 20 converts the signal into an electrical signal. The electrical signal then passes to a multiplexor 21 and is then amplified by amplifier 11 and passed to the loudspeakers 3.

Similarly, electrical signals from the microphone 4 pass into amplifier 12 before entering the multiplexor 21 and being passed to optical converter 20. The signal is converted in the converter 20 into an optical signal and transmitted down fibre-optic cable 17 to optical convertor 19. The optical signal is converted to an electrical signal in the converter 19 and passes to multiplexor 18 before being amplified by

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further amplifier 15 before passing through connector 16 into the mobile telephone 2.

Thus the present invention provides a means for isolating the  
5 headset and microphone from the RF radiation emitted by the  
mobile telephone. Although the RF radiation may pass from  
the mobile telephone to the optical converter, conversion to  
an optical signal effectively eliminates RF radiation and  
passes only audio wavelengths to the headset. The  
10 loudspeakers and microphone are therefore isolated from RF  
radiation which may otherwise pass along the conductors.

## CLAIMS

1. A headset arrangement for a communications device (2) comprising: means (7, 16) for connection to the communications device to receive therefrom and/or transmit thereto an electrical signal; headset means (1) including at least one of a loudspeaker (3) and a microphone (4); first conversion means (9, 14; 19) connected to the connection means for converting between the electrical signal at the connection means and an optical signal; second conversion means (10, 13; 20) connected to the headset means for converting between an electrical signal at the headset means and an optical signal; and fibre-optic transmission means (5, 6; 17) communicating an optical signal between the first and second conversion means.
2. A headset arrangement as claimed in claim 1, characterised in that two loudspeakers (3) are provided.
3. A headset arrangement as claimed in claim 1 or 2, characterised in that the headset arrangement incorporates both a loudspeaker (3) and a microphone (4).
4. A headset arrangement as claimed in claim 3, characterised in that two separate fibre-optic transmission means (5, 6) are provided to transmit optical signals, one

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for the microphone (4) and the other for the loudspeaker(s) (3).

5. A headset arrangement as claimed in claim 4,  
5 characterised in that the first and second conversion means each comprise means (13, 14) for converting signals for the microphone (4) and means (9, 10) for converting signals for the loudspeaker(s) (3).
- 10 6. A headset arrangement as claimed in claim 3, characterised in that a single fibre-optic transmission means (17) is provided to transmit optical signals, first and second multiplexor means (18, 21) being provided for combining and separating the electrical signals at each end  
15 of the fibre-optic transmission means.
7. A headset arrangement as claimed in any preceding claim, characterised in that amplifier means (12, 15) is provided for amplifying signals from the microphone (4).
- 20 8. A headset arrangement as claimed in any preceding claim, characterised in that amplifier means (8, 11) is provided for amplifying signals to the loudspeaker(s) (3).
- 25 9. A communication method for communicating a signal between a communications device (2) and a headset means (1)

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comprising the steps of: converting between an electrical signal at the communications device and an optical signal in a first conversion means (9, 14; 19); converting between an electrical signal at the headset means and an optical signal in a second conversion means (10, 13; 20); and transmitting the optical signals between the first and second conversion means by way of a fibre-optic transmission means (5, 6; 17).

10. A communication method according to claim 9,  
10 characterised in that two loudspeakers (3) are provided as part of the headset means (1).

11. A communication method according to claim 9 or 10,  
characterised in that the headset arrangement incorporates  
15 both a loudspeaker (3) and a microphone (4).

12. A communication method according to claim 11,  
characterised in that two separate fibre-optic transmission means (5, 6) are provided to transmit optical signals, one  
20 for the microphone (4) and the other for the loudspeaker(s) (3).

13. A communication method according to claim 12,  
characterised in that the first and second conversion means  
25 each comprise means (13, 14) for converting signals for the

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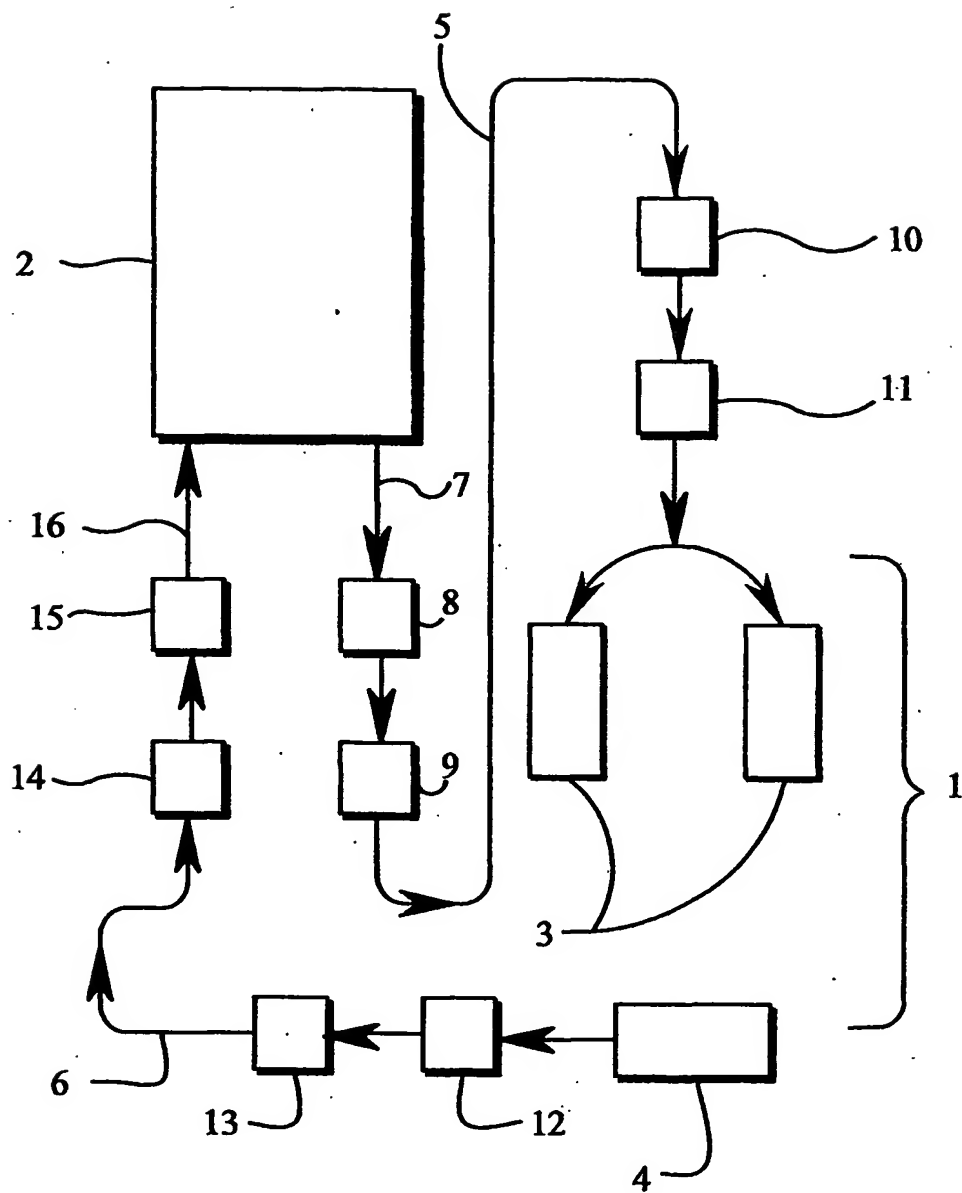
microphone (4) and means (9, 10) for converting signals for the loudspeaker(s) (3).

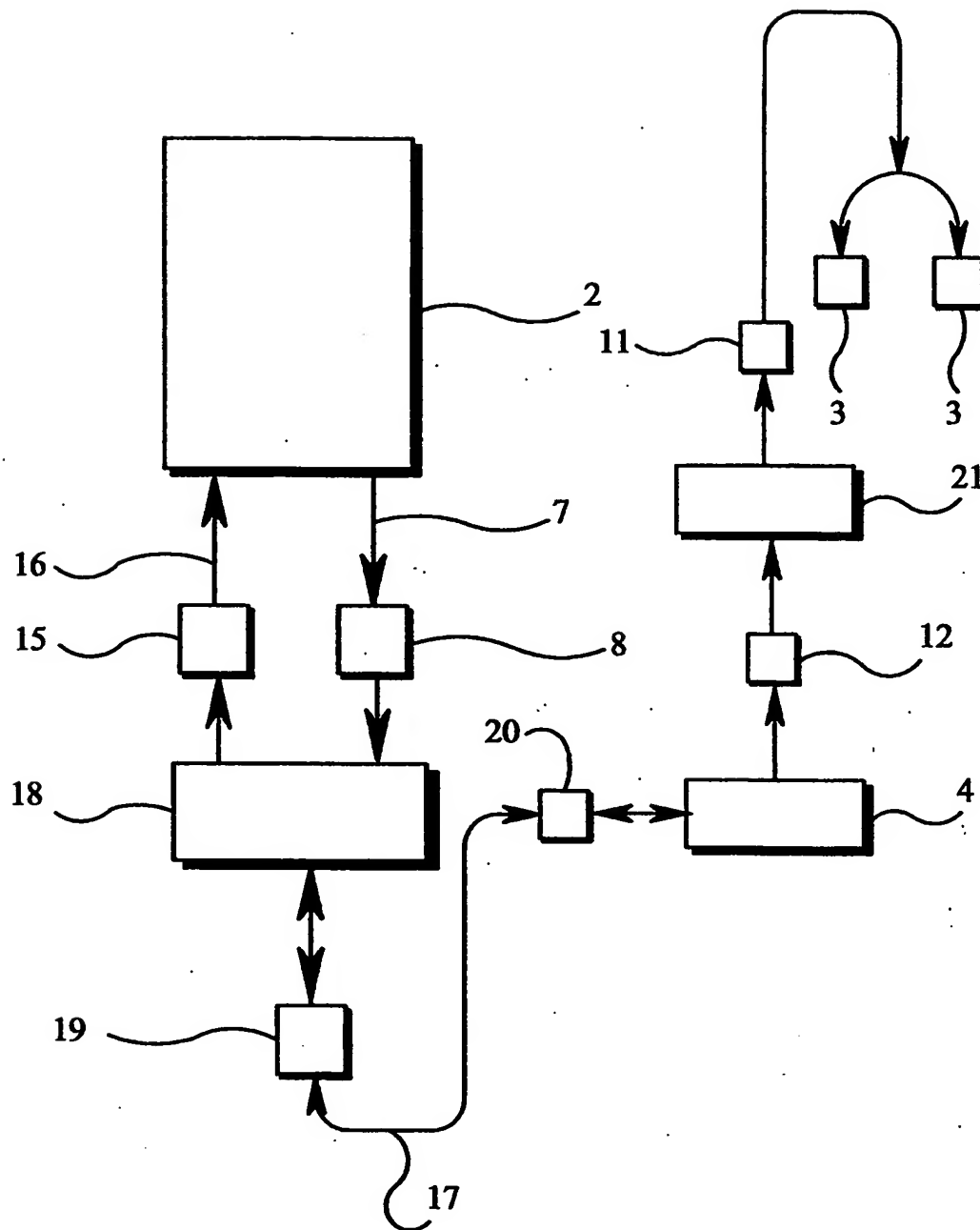
14. A communication method according to claim 12,  
5 characterised in that communication is effected by a single fibre-optic transmission means (17), first and second multiplexor means (18, 21) being provided for combining and separating the electrical signals at each end of the fibre-optic transmission means.

10

15. A communication method according to any one of claims 9 to 14, characterised in that amplifier means (12, 15) is provided for amplifying signals from the microphone (4).

15 16. A communication method according to any one of claims 9 to 15, characterised in that amplifier means (8, 11) is provided for amplifying signals to the loudspeaker(s) (3).



Figure 2



## INTERNATIONAL SEARCH REPORT

International Application No

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**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 H04M1/05 H04M1/60 H04B1/38

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04M H04B H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, COMPENDEX, IBM-TDB

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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X	WO 98 06183 A (ERICSSON TELEFON AB L M) 12 February 1998 (1998-02-12) page 4, line 21 -page 5, line 32 page 6, line 33 -page 9, line 18	1-16
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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